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# China Report

SCIENCE AND TECHNOLOGY

No. 37



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## NATIONAL DEVELOPMENT

### SECOND NATIONAL CONGRESS OF SCIENTIFIC, TECHNICAL SOCIETIES IN PROGRESS

Beijing GUANGMING RIBAO in Chinese 16 Mar 80 p 2

[Article by Zhang Tianlai [1728 1131 0171], Lin Yushu [2651 3768 2885] and Liu Qun [0491 5028]: "Sidelights on the Second National Congress of Chinese Scientific and Technical Societies"]

[Text] A stream of happy people with joy on their faces and in their voices crowded into the stately Great Hall of the People. Precisely at three o'clock, the 1500 scientific and technical representatives from all parts of China gathered together here to convene the Second National Congress of the China Scientific and Technical Association. This is the first national level meeting of the scientific and technical community since the 1978 meeting of the National Science Congress. The delegates brought with them the results of their latest brilliant contributions to the four modernizations and their regulations, suggestions and cases for carrying out the four modernizations. A clear voice rang throughout the meeting place:

"Wholeheartedly, energetically, and singlemindedly strive to make brilliant contributions to carrying out the four modernizations!"

On the platform sat the most outstanding representatives of our scientific and technical community. Among them was 84 year old Jin Shanbao [6855 0810 1405], president of the Academy of Agricultural Science and director of the Agricultural Crop Association. After attending a national discussion meeting to suggest ways to accelerate our building of agricultural modernization, he thought nothing of the hardship of rushing to attend this congress and did so with great pleasure.

Attending today's conference were many 70 and 80 year old scholars and experts. Just like Jin Shanbao, they were all very energetic. Among the Guangdong delegates was Professor Lin Keming [2651 0344 2494], a senior member of the architectural community and Deputy Director of the China Architecture Association. Several tens of years ago he was advisor to the Zhongshan Memorial Hall project and he has designed a great many buildings of original distinction. This oldster was full of spirit

and walked with firm steps. He spent two days and one night on the train from Guangzhou to Beijing, but upon his arrival in the evening he took up pen to draft a suggestion. While all other lights in the several hundred rooms of the ten-odd story hotel were dark, this old man bent his head beneath the lamp busily writing until three o'clock in the morning. He said that the party's policy regarding intellectuals should be continued as there are still some leading comrades who cry "upstarts" when they hear scientists and technicians offer differing opinions. He also made a variety of suggestions for operating the associations, pointing out that some leading persons are unable to figure out the associations and feel that it makes no difference whether they exist or not, while some other leading persons do not support the activities of the associations and use various pretexts to prevent the members from participating in the activities. Therefore, he feels that the key to the successful operation of the associations is leadership approval.

On the platform was Wang Shouwu [3769 1343 2976], the well-known member of the semi-conductor and integrated technology association and Deputy Director of the Semi-conductor Institute. He is especially energetic right now. Two months ago in this very place, in this brilliant Great Hall of the People, Comrade Hua Guofeng as representative of the State Council personally presented him with the award of National Model Worker. Today, as Wang Shouwu again comes to this hall to gather together with the nation's science delegates, he is even more conscious of the concern felt by party and state for scientific affairs. He is fully confident that the nation will carry out the four modernizations. Comrade Wang Shouwu was in charge of the development of the large-scale integrated circuit 4096 position MOS storage device. He was able to unify everyone, and after a brief period of effort, they used Chinese equipment and materials to raise the rate of completion for the 4096 position MOS storage device by over 20 percent. Their experience proves that if we merely follow the objective laws in operations, strictly adhere to scientific principles and a prescribed work system, our level of science and technology certainly can quickly approximate or overtake the advanced world level. The party and the people highly value the contribution of Wang Shouwu. Even with his glorious accomplishments, he is still continuing to make advances. He set a new research project for himself, namely, to again raise the completion rate of the 4096 position MOS storage device and also discover ways of lowering its cost. Wang Shouwu believes that to accomplish these goals the activities of the scientific associations must play a very important part. The activities of the scientific associations can open up exchange of scientific and technological information and broaden the field of vision of scientific and technical personnel. It will also promote the popularization of science and generally increase the people's scientific



and technical level. In this way we can truly attain the use of scientific methods in managing science and technology and in directing production, and forge an organic link between scientific research and production and quickly turn the results of scientific research into production forces.

The China Forestry Association delegates attracted the attention of the people. Some of them are already white-headed yet are more energetic than most people and forget their fatigue in their concern for the four modernizations. Professor Wu Zhonglun [0702 0022 0342], a 66 year old forestry expert, on the evening of the 13th, before coming to the meeting, was busy with the draft of his speech, incorporating the proposals made by experts at two forestry conferences regarding construction in the mountainous tropical and semi-tropical regions. The proposals of these experts had a strategic outlook. They brought out an important point which people have ignored for years: in our tropical and semi-tropical mountain regions the water and temperature conditions are ideal, the seasonal rains and growing seasons are matched, producing a peerless treasure unmatched in the world. About 70 percent of the land is mountainous, the so-called "seven parts mountain, one part water and two parts field," but for a long time the people have concentrated on the one part water and two parts field and have forgotten the seven parts mountain, which totals 2.1 hundred million mu. The forestry experts say that we should focus our attention on the seven parts mountain. They have made a preliminary plan: by the year 2000, after the development of a 50 million hectare commercial forest has entered the cyclical cutting stage, an annual harvest of 5 billion square meters of timber will be produced. Another item is development of wood-oils such as tea-oil. The present 50 million acres of tea-oil forest, with promotion of improved varieties, reclamation and nurturing, can attain per acre production of 20 jin, with annual production reaching 1 billion jin. By the end of the century, if acreage can be expanded to a billion acres, production quantities will be even more promising, with large scale expansion of such wood-oil sources as olive and hickory trees. Another item is the development of 10 billion hectares of economic forests. This includes both special and famous Chinese products as well as imported varieties, for example, rubber trees, oil palms, coffee plants.... There also ought to be development of bamboo forests and tea, fruit and mulberry plantations. In addition, there should be development of 30 million hectares of new fuel and fodder forests. This beautiful prospect is really enticing!

Their ideas and suggestions elicited the serious attention of the appropriate parties.

The delegation of the China Mechanical Engineering Society attending this meeting gave everyone an opportunity to enjoy new experiences. Their work has received the praise of a great many people. This society was founded in 1951 and is the most all-inclusive professional society. It resumed activities in September of 1978 and in the past year and a half has become re-established or newly established in 29 provinces, municipalities, and autonomous areas. Their most valuable experience has been in organizing activities which span the gaps between the different professions. There is a plant in Shijiazhuang which produces miniature motors which are sent to Xianggang and various Southeast Asian countries, where they are well received. Not long ago a purchaser of miniature motors wished to use this motor in a household appliance, but discovered that it was too noisy and suggested that the noise level be reduced from over 70 decibels to less than 60 decibels. This required the cooperation of personnel in the fields of aerodynamics, vibration, materials and structure. The Mechanical Engineering Society of Shijiazhuang undertook this task and invited the appropriate experts and engineering personnel to "consult," make plans and perform tests. Before long they had found a satisfactory solution for the problem, and the new product was welcomed by the purchaser. The Mechanical Engineering Society also extensively conducts brief classes to train scientific and technical personnel. The Mechanical Engineering Society of Shenyang has conducted 16 classes and trained over 1,600 people. In discussing their experiences a deputy secretary of the society said that if they become active and achieve results the party and government leadership departments will then consider them important and the difficulties will then be easier to overcome.

The conference is in progress. There are many enthusiastic congratulatory speeches, all with thunderous applause, sounding like a series of battle drums signaling the advance of the four modernizations. We believe that they will yet be even more joyful, taking broad strides toward a bright future.

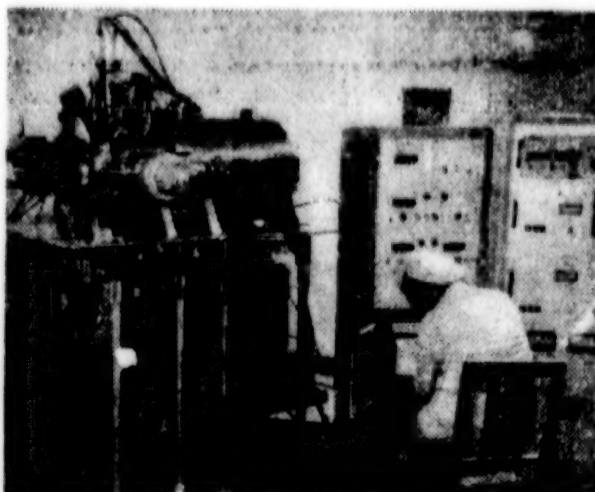
11582  
CSO: 4008



RESEARCH ON MOLECULAR BEAM EXTENSION CALLED SUCCESS

Beijing GUANGMING RIBAO in Chinese 28 Apr 80 p 1

[Photograph and caption]



The Institute of Physics of the Chinese Academy of Sciences, in conjunction with the Seventh Ministry of Machine Building and concerned units, has successfully trial-manufactured China's first molecular beam extension facility. It has been judged that its capabilities are ranked right along with similar facilities in foreign countries. Its successful trial-manufacture has provided new scientific experimental methods for research into crystal growth dynamics, solid surface research, as well as for the development of new materials and equipment, etc.

CSO: 4008

## APPLIED SCIENCES

### RESEARCH IN MICROWAVE SPECTROSCOPY, ATOMIC PHYSICS

OW191204 Beijing XINHUA Domestic Service in Chinese 0153 GMT 19 Mar 80 OW

[Text] Beijing, 19 Mar--Many encouraging results have been achieved in recent years in microwave spectroscopy, a new and developing branch of basic research in our country.

Microwave spectroscopy studies the laws governing the interaction between microwaves or radio waves and matter. Using microwave spectroscopic methods, one can investigate the microscopic structure and state of motion of matter. This branch of research has developed rapidly. It has already penetrated into the fields of physics, chemistry, biology, genetics, medical science, astronomy, earth sciences, mineralogy, and so forth and is being extensively applied in national economic and defense construction. For example, in the industrial field, microwave spectroscopy can be used in such processes as catalysis, synthesis, isotope separation, pharmaceutical analysis, structural survey of organic compounds, analysis of high polymers and so forth. In the agricultural field, it can be applied in the study of nitrogen fixation, photosynthesis, agricultural chemicals, seed selection and so forth. It can also be used to accurately determine the position of aircraft and man-made satellites and provide the most precise time standard for navigation and communication.

A national symposium on microwave spectroscopy and atomic and molecular physics was held recently in Beijing. A number of papers presented at the symposium revealed that in the past 3 years or so scientific workers in our country have made important advances in the study of this new science. Among the achievements are studies in nuclear magnetic resonance and paramagnetic resonance, which have penetrated into many areas including catalysis, irradiation effect, high polymer, chemical structure, crystal structure, solid state physics, and so forth. Fairly good achievements have also been made in electromagnetic resonance instruments and experiment methods. Achievements in the area of frequency scale have reached a fairly high level and have been commended by the departments concerned. Some papers offered new ideas on the basic theoretical study of a certain frequency scale.

The symposium also discussed the results of domestic research in the field of atomic and molecular physics; discussed many atomic wave function analytic representations, scattering of low-velocity electrons against atoms, visible molecular glow produced by strong infrared lasers, the blending of triple and quadruple harmonic of lasers in alkali metal vapor [ji guang zai jian jin shu zheng qi zhong de san ci xie bo he si bo hun he 3423 0342 0961 4354 6855 1466 5544 3049 0022 4104 0005 2945 6168 3134 0735 0934 3134 3236 0678], the ionization phenomenon and design problems in shock wave tubes [ji bo guan zhong de li hua xian xiang he she ji wen ti 3423 3134 4619 0022 4104 4418 0553 3807 6272 0735 6080 6060 0795 7344]; and probed for possible interstellar strong microwave radiation phenomena with the Cerenkov mechanism.

CSO: 4008

USE OF EXPLOSIVES TO INFLUENCE CONVECTIVE CLOUDS STUDIED

Beijing DAQI KEXUE [SCIENTIA ATMOSPHERICA SINICA] in Chinese Vol 3, No 3  
Sep 79 pp 280-288

[Article by Huang Meiyuan [7806 5019 0337], Xu Huaying [1776 5478 5391], Wang Angsheng [3769 2491 3932], He Zhenzhen [0149 3791 3791], Chen Yingyi [7115 5391 0308], Xu Naizhang [1776 0035 3864], etc.\* of the Research Institute of Atmospheric Physics, Chinese Academy of Sciences: "Studies on the Principle of Using Explosives to Influence the Development of Convective Clouds"]

[Text] The use of explosives as artificial means of hail prevention is a feature with a very long history in our country. Over the past decade, the explosion method has been extensively used in mass experiments and further developed into air explosives, rockets and high altitudinal explosives. According to preliminary analysis (1,2) of many years of hail prevention data in some places, the use of explosion as artificial means of hail prevention can produce certain results. But what is the affect of explosion on clouds? Does it have any influence on the formulation of hail? In foreign countries, it is suggested that the formulation of soft hailstones caused by "cavity action" can be used for interpreting the impact of explosion on hailclouds (3). It is also suggested that explosion can cause cold water to freeze (4). But, in our country, extensive artificial hail prevention tests indicate that explosion can rapidly give rise to precipitation, and cause cloud holes, cloud cell dissipation or diversion (5,6,7). Such phenomena can not be interpreted with the preceding hypotheses which had originated in foreign countries.

To explore the principles of the use of explosives to prevent hail, beginning in 1972, we have conducted a series of indoor and field experiments to determine the possible physical effects of explosions on convective clouds. On this basis, further research has been done to determine the value of applying the physical effects in artificial hail prevention.

\* Other participants in the project: Chen Zhangzhao [7115 4545 2507], Yang Yunyu [2799 5686 3768], Hong Yanchao [3163 6389], Zheng Shuangzhi [6774 7175 3112], He Jingfu [6787 0079 3940], Zhang Dalin [1728 1129 2651], Zhao Xiaoning [6392 1420 1340].

# 1. Assimilation Tests of Explosion Effects on Updrafts

In view of the fact that convective clouds are formed and sustained by the continuous updraft in the air, we suggest it is possible that explosions can affect the ascending air columns and thus change the process of convective cloud development. In our assimilation tests, ascending smoke columns were used as updraft columns, and they were bombarded with small locally-produced cannons, which enabled us to observe the movements of the smoke paths following the bombardment.

To assimilate updraft with smoke, it was necessary to satisfy similarity conditions, chiefly geometric similarity and dynamic similarity. The vertical scale of updraft columns within clouds had to be one grade larger than the horizontal scale. In the tests, the smoke column widths were set at 0.5 and 1.0 cm, the lengths were 15 and 30 cm, and the ratio between length and width was 30. Thus, the air columns and smoke columns were basically similar.

When we consider the external forces on convective activities within and below the clouds, the vertical movement equation can thus be expressed as follows:

$$\frac{\partial w}{\partial t} + w \frac{\partial w}{\partial z} = -g \frac{T'}{T} + k \frac{\partial^2 w}{\partial z^2} + F \quad (1)$$

in which  $w$  represents vertical movement velocity,  $t$  is time,  $g$  is gravitational acceleration,  $T$  and  $T'$  are environmental temperature and cloud internal and external temperature difference,  $k$  is the exchange coefficient of turbulence, and  $F$  is external force.

When a smoke column is used to assimilate the constant stream field of an air column, two nondimensional parameters are involved, i. e. Reynolds number  $Re$ , which is the ratio between the inertial force and viscous force, and Froude number  $Fr$ , which is the ratio between the inertial force and buoyancy force; the values of both parameters in atmospheric convective air columns and experimental smoke columns are shown in Table 1.

表 1 气柱和烟柱参数表

		3) $H$ (米)	4) $U$ (米/秒)	5) $u$ (米/秒)	6) $T$ (°C)	7) $Re$	8) $Fr$
(1)	大气(对流气柱)	1000	5	50	0.5	100	1.2
	烟 半烟 <sup>a</sup>	0.15	0.4	$0.2 \times 10^{-4}$	33	3000	1.1
(2)	柱 文地 <sup>b</sup>	0.30	0.7	$0.2 \times 10^{-4}$	49	10000	1.0

Table 1 Air Column and Smoke Column Parameter Values



# Key (Table 1)

- (1) atmospheric convective air column
- (2) smoke column
  - (a) single strand
  - (b) stack of *Artemisia argyi*
- (3)  $H$  (m)
- (4)  $w$  (m/sec)
- (5)  $k$  (sq m/sec)
- (6)  $T'$  (degrees Centigrade)
- (7)  $Re$
- (8)  $Pr$

From Table 1, it is evident that the  $Pr$  numbers in the experiment are on the same grade level as those in the atmosphere; the Reynolds numbers are all much greater than 1; the viscosity can be neglected. Thus, it is safe to assume that the smoke column streamfield is basically similar to the air column streamfield.

In equation (1), there are two other dimensionless parameters: one is the Strouhal number  $St$  which is the ratio between inertial force and dimensionless constant force; this parameter may be used in conjunction with the time of nonconstant variations determined through explosion tests to compute the time of constant variations caused by explosions in the atmosphere. The other parameter is the ratio between inertial force and external force. To simplify matters in our discussion, we regarded the impact of explosions on air columns as a kind of external force. We also believed that when the shock waves of the explosions passed through the airstreams, they produced a kind of super-pressure which acted in the form of external force on each unit mass of air in the airstreams. This particular kind of force is expressed in terms of super-pressure gradient, i. e.  $\frac{1}{\rho} \frac{\Delta P}{\Delta H}$ , in which  $P$  is super-pressure,  $\rho$  is air density. Thus, the ratio between inertial force and explosion force is:  $\frac{w^2}{H} / \frac{1}{\rho} \frac{\Delta P}{\Delta H} = \frac{w^2 \rho}{\Delta P}$ . This is called the Eulerian number  $E$  of explosion force, which is a dimensionless parameter.

The object of our experiments was to create smoke columns which satisfied geometric similarity and movement similarity conditions, and thus study the affects of explosions on the smoke columns. The tests helped to determine the critical super-pressure (produced by explosion shock waves) which caused the smoke columns to undergo remarkable variations, as well as the length of time during which the smoke column variations sustained under the impact of the critical super-pressure.

The tests were conducted indoors. The smoke columns were produced from burning strands of *Artemisia argyi*. Small explosives were locally produced with 1-2 grams of black gunpowder. The shock wave intensities (super-pressure) at varying distances could be determined through the tests. A movie camera was used to record the smoke columns before and after the explosions. The movements of characteristic particles in the fume columns

were analyzed to determine the velocities of the smoke columns, and the test results were as follows:

(1) 0.2-0.3 seconds after the explosion, the smoke paths began to swing under the impact of the explosion waves, and the ascending velocity retarded; 1 second later, the smoke paths restored their vertical ascent and velocity. Hence,  $St = 0.3 - 1.3$

(2) When single strands of Artemisia were used to produce fumes ( $H=15$  cm,  $w = 40$  cm/sec,  $T' = 33$  degrees Centigrade), and the maximum super-pressure of shock waves exceeded 2 grams per sq cm, the smoke paths swayed. When the fumes were produced from stacks of Artemisia ( $H = 30$  cm,  $w = 70$  cm/sec,  $T' = 49$  degrees Centigrade), the critical super-pressure which caused the swaying was 7 grams per sq cm. Hence, the corresponding E value of the explosions were 0.8 and 0.7.

Based on the principle of similarity (i. e. same  $St$  and  $E$  values), we can deduce the following: When the velocity of air columns in the atmosphere is below 3 m/sec, the air columns can be affected under ordinary explosion intensities (the maximum super-pressure of shock waves should not be less than 34 grams per sq cm); but intensive explosions (maximum super-pressure of shock waves should exceed 600 grams per sq cm) must be used in order to affect air columns ascending faster than 10 cm/sec.

(3) When the critical super-pressure is greater than 3 grams per sq cm, the shock waves affected single strand Artemisia fumes from top to bottom, and observation results revealed an updraft inhibitive effect which could cut down the ascending velocity of the smoke columns by 20-30 percent.

Besides, based on  $St = \frac{wT}{H}$ , we obtained  $T = \frac{St \cdot H}{w}$ , i. e. the nonconstant variation time of the air columns in the atmosphere affected by the explosion tests showed  $St = 0.3 - 1.3$ . Thus, the  $T$  of the air columns should be 100-260 seconds, i. e. approximately 2-4 minutes. It is evident that when explosions occur inside or beneath clouds, the effect of the explosions on the airstreams can last several minutes, which is long enough to influence the internal processes of clouds. In other words, before its influence begins to fade, the first explosion should be followed up by another one; this kind of continuous bombardment can cause air columns to fall under continuous influence; and when the air columns are affected for a long period of time, they are bound to produce remarkable influence on the internal processes of clouds.

## II. Bombardment Effects on Precipitation (7)

In order to study the effects of bombardment on clouds and precipitation, the first step we took was to conduct "cannon shot rain" tests, i. e. to promote precipitation with the aid of cannon shots, which is frequently seen in artificial hail prevention tests and relatively easy to observe.

From 1973 through 1974, a 37 high altitude cannon was used to bombard 16 convective cloud cells, totalling 44 times. Before and after each shot, the researchers measured the raindrop spectrum, and thus came up with the following results in their study on the effects of bombardment on precipitation:

1. The cannon shots helped to produce precipitation from convective clouds which had not rained.

Out of 13 test runs on convective clouds which had not rained, 10 succeeded in producing precipitation following the bombardment. Generally, a few raindrops fell 1-2 minutes after the cannon fire, and huge amounts of raindrops were detected within 4-5 minutes. Estimations based on the final velocity of the raindrops suggested that the raindrops could have precipitated from the middle and lower portions of the clouds. Figure 1 is an example of the development of rain intensity against time following the bombardment on cumulus congestus clouds which had not rained; the test was conducted at 15:36 on July 28, 1973. Analysis of Figure 1 and raindrop spectrographic data indicated that 1-2 mm raindrops had fallen 3 minutes after the cannon shots, and the precipitation intensity increased sharply 6 minutes later.

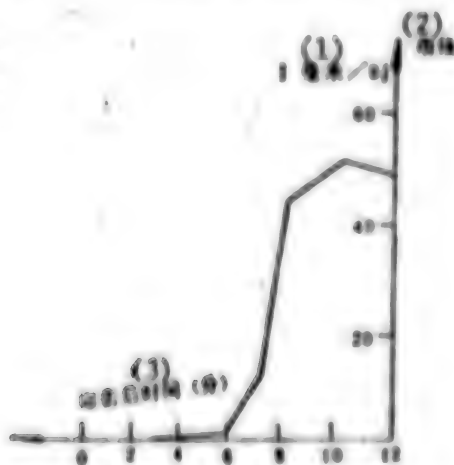


图1 炮击未雨云降水时降水一例

Figure 1 Example showing precipitation effects of bombardment on convective clouds which had not rained.

- (1) 1 mm/hr
- (2) rain intensity
- (3) time (min) following bombardment

2. Bombardment increased precipitation of clouds which had already rained.

We have found that "cannon shot rain" is also reflected in increasing rain shower through bombardment of convective clouds which had already rained.

Out of 31 test runs on precipitation cloud cells, 26 could be analyzed, and there were 21 cases in which both the total density of raindrops and rain intensity were increased following the bombardment. Continuous raindrop spectrographic observations indicated that after the bombardment, the density of raindrops of all sizes had generally increased, especially 1-2 mm raindrops; then, they either decreased or went back to their original spectrographic pattern. Moreover, during many test runs, secondary raindrop spectrographic peak values were recorded after the bombardment and, according to observation data, this kind of phenomena had occurred in approximately 80 percent of the test runs. Figure 2 is an example of raindrop spectrographic changes under the impact of bombardment. It was recorded at 17:48:35 on August 21, 1974 before and after the bombardment. Prior to the artillery fire, the rain intensity was very small, and there was no distinct secondary peak value in the raindrop spectrum. 0.5 minutes after the bombardment, there was an extensive increase in large and small raindrops plus secondary peak value. Two minutes later, the spectrum further broadened, and the rain intensity reached the maximum value. Six minutes later, the rain intensity began to decrease, and the spectrographic pattern went back to its original non-secondary-peak status.

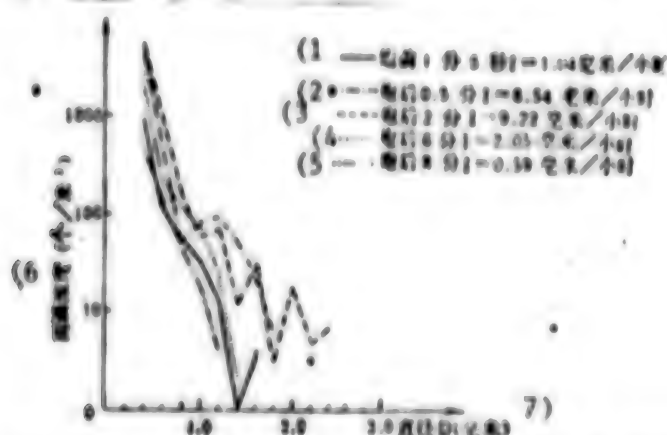


图2 炮击影响雨滴谱图形变化一例(1974年8月21日,浓积云)

Figure 2 Example of raindrop spectrographic changes under impact of bombardment (Aug. 21, 1974 cumulus congestus clouds)

- (1) 1 min 5 sec prior to bombardment  $I = 1.04$  mm/hr
- (2) 0.5 min after bombardment  $I = 6.54$  mm/hr
- (3) 2 min after bombardment  $I = 9.22$  mm/hr
- (4) 6 min after bombardment  $I = 2.05$  mm/hr
- (5) 8 min after bombardment  $I = 0.59$  mm/hr
- (6) raindrop density (drop/cubic meter)
- (7) diameter  $D$  (mm)

In order to compare the bombardment effects on convective clouds and alto-stratus clouds, further tests were conducted in the precipitus alto-stratus clouds. Although the bombardment effects were not as great as in the case of convective cloud intensity variations, secondary peak values did occur in the raindrop spectrographic patterns following the bombardment. Owing to the fact that the precipitation of stratiformis clouds is generally stable and seldom varies, and that double peaks very seldom occur, the preceding phenomena helped to further reveal the effects of bombardment.

The preceding observation data indicated that the bombardment had actually affected clouds and precipitation. The cannon shots helped to bring about precipitation from convective clouds which had not rained, and the results were quick. The rain started to fall from the lower portions of the clouds. When the cannon fired into clouds which had already begun to rain, the rain intensity and density rapidly increased, and the spectrographic pattern was affected as well. Some of the affected raindrops had come from the clouds, while the others probably came from the precipitation space below the clouds. Such phenomena indicated that the bombardment effects were fast, and it is possible that the dynamic force had caused the air currents inside the clouds or within the precipitation space beneath the clouds to undergo some kind of changes which led to precipitation. Initial theoretical calculations indicated that so as long as the explosions clouds change the updraft, it was possible to cause clouds to rain ahead of time or increase precipitation for a short duration. Moreover, 2-3 minutes after the bombardment, changes occurred in the surface raindrop spectrum. The appearance of secondary peak values suggested the possibility that the bombardment could have caused some droplets to coalesce and large drops to break up, thus bringing about a momentary acute increase of raindrops measuring 1-2 mm in diameter which was related to the bombardment.

### III. Convective Cloud Bombardment Tests

One way of exploring the effects of explosion on precipitation was by analyzing cloud shape variations following the bombardment. For this purpose, in 1973 and 1974, we used a 37 high altitude cannon to bombard convective clouds which were in the process of development. Macroscopic observation of the cloud variations were conducted from the ground surface with cameras, movie cameras, theodolites, as well as fixed-angle cloud contour sketching and gun-directing range-finders.

During the 13 test runs which lasted 2 years, cloud cell scattering at varying degrees occurred in most cases when the cannon shots were aimed at medium and small size cumulus cloud tops approximately 1-3 km thick. For instance, on July 16, 1974, three cloud cells A, B, and C were relatively well defined prior to the bombardment. Located on top of the cloud cell at the back side of the cloud body, cloud head C was the target of the cannon fire. Cloud cell B was chosen as the contrast cell; from its angle of elevation (Figure 3), it could be seen that prior to the bombardment, it was in the midst of a simple descending motion at the rate of 1.0 m/sec.



Following the bombardment, the contrast cell B was stable and hardly changed. But target cell C, which had continued to climb at the rate of approximately 0.9 m/sec prior to the cannon fire, immediately began to descend at the rate of 3.3 m/sec after it was hit. Comparison study of the two cells showed that following the cannon fire, the bombarded cell C stopped growing upwards and ceased to remain stable; instead, it immediately plunged into a descending motion, and the time of reversal corresponded exactly with the time of bombardment.

Figure 3 Example of altitudinal development (angle of elevation) of convective cloud cell after cannon shot.

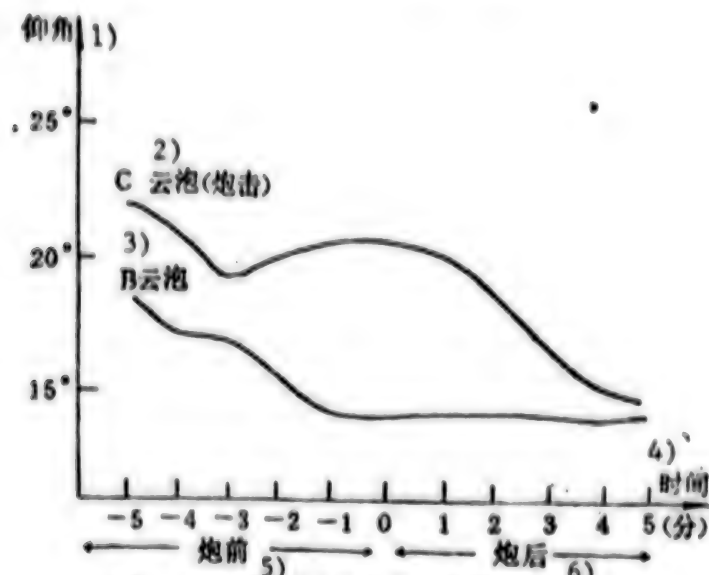


图3 炮击前后对流云泡的高度(仰角)演变一例

- |                          |                           |
|--------------------------|---------------------------|
| (1) angle of elevation   | (2) cloud cell C (target) |
| (3) cloud cell B         | (4) time (min)            |
| (5) prior to bombardment | (6) following bombardment |

We also encountered the following case in the course of our observations on July 19, 1974: As the cannon shell entered the cloud (as indicated by the arrowhead), a gap measuring about 100 meters across appeared 2 minutes after the cannon fire (Figure 4); 3 minutes after the shot, the gap developed into a hole with well-defined structure; at 3.5 minutes, the hole gradually disappeared. This was another form of partial bombardment effect on cloud structure.

In another instance, on July 26, 1973, after the top and middle portions of a cloud were hit by the cannon, the cloud body rapidly expanded, but its structure was very loose and scattered, which was a very rare phenomenon in natural variations.

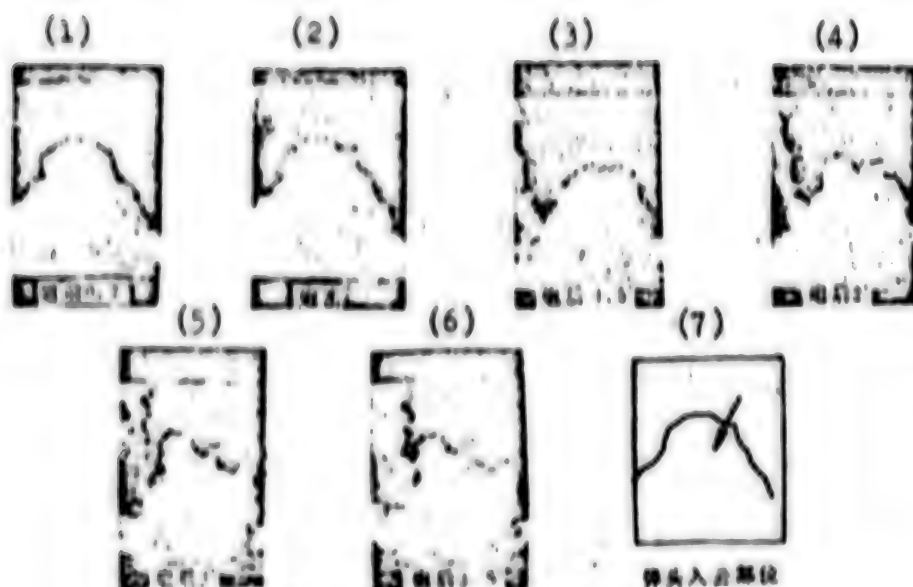


图4 炮击对云结构的局部影响一例

[Best reproduction available]

Figure 4 Partial effect of bombardment on cloud structure

- (1) 0.7 min before cannon shot
- (2) cannon shot
- (3) 1.5 min after cannon shot
- (4) 2 min after cannon shot
- (5) 3 min after cannon shot
- (6) 3.5 min after cannon shot
- (7) position at which the cannon shell entered the cloud

In sum, as post-bombardment cloud dissipations have been observed on numerous occasions, they are not likely to be purely coincidental. Generally, the cloud head is the best place to start cloud dissipation, which is probably due to the inhibitive action of the bombardment shell on the updraft.

#### IV Radar Observation Study of Bombardment Effects on Hailclouds

In order to further study the dynamic effects of explosions on hailclouds, from 1975 to 1977, we conducted radar observations on the effects of explosions on strong thunderstorms (mostly hailclouds) in conjunction with artificial hail prevention tests in Shanxi Province's Xiyang County (8). The general procedures of observation were as follows: As the hailclouds approached the cannon point, we enhanced radar observation. When the hail prevention headquarters decided on starting the bombardment operations, both the cannon point and radar station were notified at the same time. Thus, the radar could continuously observe the bombarded area on the cloud, and it was possible to record the cloud changes before and after the bombardment. Over the past 3 years, there have been 11 relatively successful observations on bombardment effects (10 were hailclouds). Table 2 is a brief summary of the radar observation results in each bombardment.

As shown in the table, among the 11 radar observations on the bombardment of intensive thunderstorm clouds, except for two cases, nine revealed the following phenomena:

1. Echo holes, gaps or weak areas appeared in the bombarded spots. Their horizontal dimensions could be distinguished from the echo waves (approximately 1 km) up to 3-4 km. The hole first appeared in the explosion layer (2-4 km high), and could be generally distinguished very soon after the explosion (approximately several minutes); the maximum duration of retention is over 15 minutes.

表 2 红炸响炮对云雷达观测记录

1) 序号	2) 日期	3) 炮击时间	炮击方位 (公里)	5) 主要雷达特征及炮击前后变化情况
1.	75.7.14	a) 18 <sup>00</sup> -19 <sup>00</sup> 主要在前10分钟内射击	234 85	a) 炮击部位出现明显空洞, 最大水平尺度达 4-5 公里, 高度在 3 公里以下, 出现至炮击后 15 分钟, 西南雷达站观察到此现象, 同时高度下降 1.6 公里, 云体减弱, 上面有碎屑, 炮击下面无云。
2.	75.8.11	22 <sup>00</sup> -19 <sup>00</sup>	28	b) 炮击部位短时出现小同波区。
3.	76.7.6	15 <sup>00</sup> -16 <sup>00</sup> b) 15 <sup>00</sup> -16 <sup>00</sup> 主要在前 15 分钟内射击	75 45	c) 炮击部位出现明显空洞, 水平尺度约 3 公里, 同波区高度下降约 5 公里, 云体减弱, 解除冰雹云威胁。
4.	76.7.10	19 <sup>00</sup> -19 <sup>00</sup>	66	d) 城关雷达发现炮击部位有碎屑, 西南雷达在 19 <sup>00</sup> 观察到此同波区裂成碎块, 同波区弱。
5.	76.7.11	12 <sup>00</sup> -14 <sup>00</sup>	67	e) 炮击部位见同波缺口, 该区分裂。
6.	76.7.12	14 <sup>00</sup> -15 <sup>00</sup>	56	f) 城关雷达观测似有小同波, 不确切。
7.	76.7.22	c) 15 <sup>00</sup> -16 <sup>00</sup> 前半段时间猛烈射击	200	g) 炮击部位出现空洞, 以后扩展至水平尺度约 3-6 公里, 炮击后同波区下降约 6 公里, 同波明显减弱, 云体逐渐分裂。
8.	77.6.25	18 <sup>00</sup> -19 <sup>00</sup>	60	h) 炮击区同波减弱, 出现同波, 云顶下降 3-4 公里。
9.	77.6.29	12 <sup>00</sup> -14 <sup>00</sup>	31	i) 炮击区出现同波, 尺度约 2-3 公里, 附近有降雹, 本站无降雹。
10.	77.6.29	d) 17 <sup>00</sup> -19 <sup>00</sup> 主要集中在前 10 分钟射击	174	j) 炮击区云顶明显下降 3-4 公里, 城关雷达出现同波区, 周围有雹, 炮击附近无雹。
11.	77.7.1	16 <sup>00</sup> -17 <sup>00</sup>	40	k) 未见异常现象。

Table 2 Brief summary of radar observation on bombard-effects on hailclouds

- (1) Order Number
- (2) Date
- (3) Bombardment Time
  - (a) mainly within the first 10 minutes
  - (b) mainly within the first 15 minutes
  - (c) intensive bombardment in first half period
  - (d) mainly concentrated in first 10 minutes

- (4) Number of Cannon Shells (fired)
- (5) Main Echo Characteristics and Parameter Developments
  - (a) Clearcut hole appeared at bombarded spot, maximum horizontal scale reached 4-5 km; altitude below 3 km stratum; over 15 minutes from birth to decay; phenomenon detected by 2 radars; echo peak height dropped 1.6 km; cloud body weakened; hail in upper stream; no hail after bombardment.
  - (b) Small echo hole appeared briefly in bombarded area.
  - (c) Clearcut hole appeared in bombardment area; horizontal scale approximately 3 km; echo wave peak height dropped approximately 5 km; cloud body weakened; hailcloud warning removed.
  - (d) A hole in bombarded spot was detected by radar just outside the city; observations made at 19<sup>13</sup> by another radar at West Gully indicated that the intensive echo wave zone broke up into fragmentary pieces, and the echo waves weakened.
  - (e) Discovered echo wave gap in bombarded area; intensive area disintegrated.
  - (f) Observations by radar just outside the city indicated possible appearance of small hole, but not definite.
  - (g) Hole appeared in bombarded area, horizontal scale subsequently expanded to approximately 3-6 km; after bombardment, echo wave peak slope dropped about 6 km; hail precipitation weakened considerably; cloud body gradually disintegrated.
  - (h) Echo waves in bombarded zone weakened; concave area appeared; cloud top dropped 3-4 km.
  - (i) Hole appeared in bombarded zone; scale approximately 2-3 km; hail occurred in vicinity; no hail at station location.
  - (j) Cloud top in bombarded area evidently sank 3-4 km; intensive area weakened as concave area appeared; hail occurred in surrounding area; no hail near cannon point.
  - (k) No anomalies.

For example, at about 15:30 on July 22, 1976, a hailcloud passed through the cannon point at 14 Daoyan (approximately 20 km from radar site). As shown in Figure 5, [not reproduced] the PPI section of the cloud had smooth edges, and the hail cloud appeared to be symmetrical from the RHI while the cloud structure was compact; there were no holes in the vicinity sky of the cannon point. The bombardment operation began at 15:37; 200 shells were fired altogether, and most of them exploded in the vicinity of the hit points at about 3 km. 5 minutes after the intensive bombardment, a concave area began to appear on the PPI echo wave at the elevation angle of 3 degrees; 7 minutes later, a clearcut hole appeared on the RHI (Figure 6a) [not reproduced]. It began at the 3 km layer and expanded slightly downwards, measuring only 1-2 km in scale. Besides the absence of decadent echo waves, the bombardment effect was also reflected in the relatively intensive echo wave areas; at 15 hours 54-55 minutes, the original bombarded spot expanded and shifted (the echo waves expanded and moved northeastwards at the rate of 1/3 km per minute), the hole expanded, and the movement caused it to slightly tilt. The horizontal scale of the hole area was approximately 3-6 km (see Figure 6b) [not reproduced]. At the same time,

the cloud body also began to show distinct signs of weakening. Within 15 minutes, the cloud peak height dropped 6 km; the suspended portion hanging vertically from the edge of the echo wave hole indicated that the downward traction of the cloud body was relatively strong, a considerable number of cloud particles descended, which accelerated the decay of the cloud.

On seven occasions, such phenomena as descending echo wave peak height, weakening cloud body, disintegration of intensive area, were observed after the bombardment. This included five instances in which the peak height dropped from 1.6 km to 6 km. For example, on June 29, 1977, there was a hailcloud; at 17:02, the RHI section revealed that the cloud head was relatively flat; within the range of 14-32 km, the cloud head was more or less 10 km. At 17:05, the bombardment began; 174 shells were fired. Five minutes after the operation, the echo waves dropped. At 17 hours 14-16 minutes, the cloud top descended extensively near the cannon point (in the vicinity area 20 km away); the cloud top dropped 3-4 km; a few km away, the cloud top maintained its original height. On that day, there was hail in the surrounding area, but no hail at all near the cannon point. Altogether, there were five such occasions in which either the hail was weakened or the hail warning was removed altogether.

It was also discovered that the results are relatively good when the bombardment cloud had formed an updraft zone, an echo wave barrier with relatively great gradient of reflectivity and an intensive echo wave zone; the effects were evident when large numbers of shells were fired in concentrated bombardment.

It may be seen from above that explosions can exert direct influence on clouds, bringing about rapid precipitation of water particles in the bombarded cloud areas, and thus cause echo wave holes or weak areas to first appear at the explosion height. This type of phenomenon occurs very quickly, but is generally short lived (several minutes), which indicates that the effect is only an initial triggering mechanism. Following the explosions, most holes developed downwards; sometimes, there were echo waves hanging vertically by the feet; sometimes, the holes expanded all the way down to the cloud base, and upward expansion very rarely occurred. This indicated that the triggering effect of explosions cloud set off a downward movement of precipitation particles and air current. These were the factors that led to the depression of cloud tops, weakening of cloud bodies, and termination of hails slightly after the appearance of the holes.

#### V. A Physical Hypothesis of the Influence on Cloud Development by Explosion

Based on many years of field observations and analytical study, we believe that the backbone of a convective cloud lies in the vertical current which plays a very important role in the growth and decay of clouds as well as the formation and collapse of cloud precipitation. The cause of updrafts is closely related to such factors as the thermodynamics and dynamics of the environmental atmosphere and near surface strata. But the growth and



decline of updrafts is inseparable from the microphysical processes inside the clouds; conversely, the microphysical processes will also affect the vertical movements inside the cloud. As this cycle repeats itself over and over again, the entire development process will change in the end.

Based on the preceding experiments and tests, we have come up with the following physical hypothesis on the influence of explosions on the development of convective clouds (see Figure 7): Under the impact of shock waves produced by the explosions, and due to the fragments and other particles which fly out at high speed following the explosions, the original updrafts in the clouds are either disturbed or changed. At the explosion height, a sinking current is induced. The disturbances in the updraft will upset the relations between the falling speed of precipitation particles and the updrafts within the clouds. If the original precipitation particles are on the ascent, when the updraft is weakened or even forced to switch to downdraft, the particles will begin to fall. If the final velocity of the original precipitation particles is in equilibrium with the ascending speed, when the disturbance upsets the equilibrium of movements, the particles will likewise begin to fall downwards. The traction of the descending particles causes the air to sink. Moreover, as the falling water droplets evaporate on their way, the unstable stratification causes the downdraft to continuously experience a negative buoyancy, which could create a relatively organized downdraft development, thus upsetting the natural development process of the clouds, or cause weak precipitation and hail to occur ahead of time, or prevent the further formation and growth of thunderclouds and hailclouds.

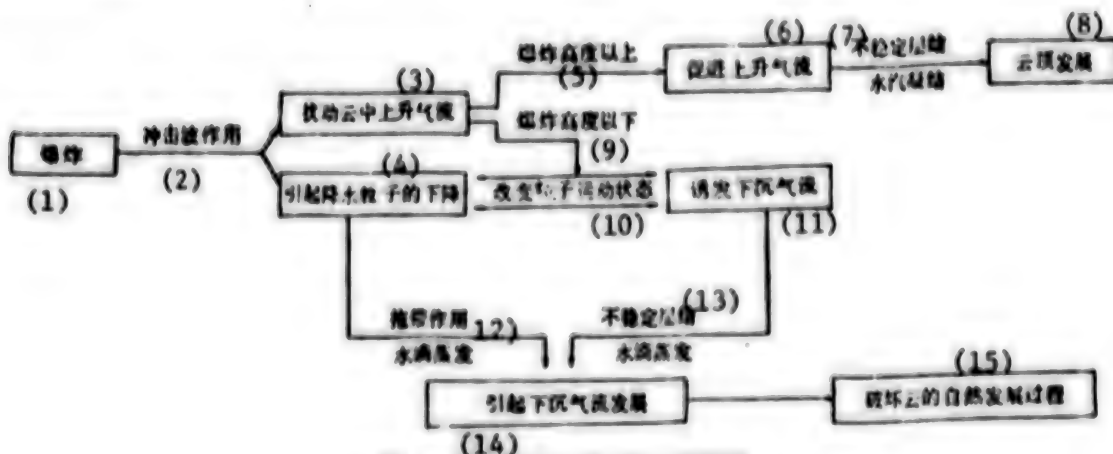


图7 爆炸影响对流云的物理设想

Figure 7 Physical hypothesis of the explosion effects on convective clouds

- (1) explosion
- (2) shock wave impact

- (3) disturbs updraft in cloud
- (4) causes precipitation particles to fall
- (5) above explosion height
- (6) stimulates updraft
- (7) unstable stratification / water vapor condenses
- (8) cloud top develops
- (9) below explosion height
- (10) changes movement status of particles
- (11) induces downdraft
- (12) traction effect / water droplets evaporates
- (13) unstable stratification / water droplets evaporate
- (14) upsets natural development process of clouds

Based on this physical hypothesis, it is possible that the explosions are more effective in cumulus clouds than stratiformis clouds because the stratification in cumulus clouds is relatively unstable, and the vertical current in the clouds is strong, while the horizontal scale is relatively small. The growth of a downdraft inside a cumulus cloud often causes the entire cloud to collapse. Conversely, the occurrence of partial downdraft in a stratiformis cloud can only cause partial effect on the cloud.

Based on the preceding physical hypothesis, it is possible that the explosions are more effective in convective clouds which already carry precipitation particles than those which do not have precipitation particles. This is especially true when the clouds are in water content accumulative areas as compared against those which are in non-accumulative areas, which is attributed to the fact that the descending motion of large quantities of concentrated precipitation particles could "stamp out" or gravely affect the original updraft in the cloud.

According to observations, the velocities of updrafts in convective clouds are distributed with height along a parabolic curve. Under such circumstances, based on the preceding physical hypothesis, maximum results could be obtained if the explosions were placed at the point of maximum velocity. This is due to the fact that the large numbers of precipitation particles which had accumulated above the maximum updraft are held there by the updraft; if the explosion can disturb or alter the updraft within a given period of time, the accumulated precipitation particles will fall; as the updraft gradually decreases at this height, it can no longer keep the precipitation particles from falling, thus destroying the natural development process.

Thus, we can assume that with ample explosion intensity, the destructive effects of explosion on cumulus growth are greater in cumulus congestus clouds than in cumulus humilis clouds, and likewise greater in thunderclouds than in cumulus congestus clouds. But they are most effective in hailclouds. In addition, based on the preceding physical hypothesis, explosions in convective clouds can also promote the cloud development under certain conditions. If the explosions occur in the middle or lower portion

of the clouds, especially when there is a relatively abundant supply of water vapor and the atmospheric stratification is very unstable, the up-draft induced by the explosion could further develop.

Apparently, this is only a preliminary physical hypothesis, and some of the processes suggested here require in-depth study, and it is necessary to conduct quantitative estimations as well.

With deep feelings of appreciation, the author cherishes the memory of Professor Gu Zhenchao [7357 7201 3390] under whose guidance this research project was initialized.

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APPLIED SCIENCES

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## APPLIED SCIENCES

### BRIEFS

**NORTHEAST ELECTRONIC EXHIBITION**--A sales exhibition of electronic products opened on 1 April in Shenyang, Liaoning. It is being sponsored jointly by the Northeast China Radio Supply Company of the Fourth Ministry of Machine Building and the electronics bureaus of Liaoning, Jilin and Heilongjiang provinces. The sales exhibition will last 1 month. [Shenyang Liaoning Provincial Service in Mandarin 1100 GMT 1 Apr 80 SK]

**TANGSHAN EARTHQUAKE BOOKS PLANNED**--Harbin, Apr 21--The Institute of Engineering Mechanics, under the Chinese Academy of Sciences, decided at a recent meeting in Harbin, northeast China, to compile two books about the Tangshan earthquake of 1976. One will be a photographic record. The data has been collated by scientists from more than 100 scientific establishments and an editorial board has been set up to compile the books. The board, under the leadership of Liu Huixian, a noted seismologist and director of the engineering institute, recorded at the Harbin meeting that it hopes to have access to overseas material about the earthquake, such as photographs taken from satellites. One of the new books, "Disaster of the Tangshan Earthquake of 1976," will contain a great deal of scientific data as well as descriptions of relief work and reconstruction. The photographic record will be called "Photographs of the Tangshan Earthquake." The two books will be completed in 1981. [Beijing XINHUA in English 0715 GMT 21 Apr 80 OW]

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## SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

### BIOGRAPHIC INFORMATION ON SCIENTISTS

[The following biographic information on selected scientists was extracted from various Chinese-language publications as indicated in parentheses at the end of each name.]

Ceng Chengkui [2582 0701 1145]

Director, Institute of Oceanography, Chinese Academy of Sciences; a noted algologist; was recently admitted to the CCP; born in Xiamen, Fujian Province; studied in the U.S. in 1940's; became deputy director of Institute of Oceanography shortly after the PRC was founded. (Hong Kong ZHONGGUO XINWEN 27 Feb 80 p 6)

Deng Zhaoxiang [6772 0340 4382]

Vice Chairman of the Board of Directors, China Navigation Society. (Beijing GUANGMING RIBAO 20 Mar 80 p 1)

Gan Fuxi [1626 4395 3588]

Deng Ximing [6772 6932 6900]

Wang Zhijiang [3769 0007 3068]

Gan is the director of Shanghai Institute of Optics and Precision Instruments, Chinese Academy of Sciences; Deng and Wang are the deputy directors of the said institute. (Beijing GUANGMING RIBAO 26 Feb 80 p 2)

Guo Shuwen [6751 2579 2429]

Director, East China Institute of Computer Technology; concurrently secretary of the CCP Committee at this institute. (Beijing GUANGMING RIBAO 8 Apr 80 p 2)

He Zhiping [6320 5268 1627]

Deputy Secretary of the CCP Committee, Chinese Academy of Agricultural Sciences. (Beijing GUANGMING RIBAO 23 Mar 80 p 3)

Hou Defeng [0230 1795 1409]

Noted geologist, mineralogist, geochemist; former member of the Academic Affairs Committee of the Chinese Academy of Sciences; died 24 Feb 80 in Beijing at age of 80. (Beijing GUANGMING RIBAO 18 Mar 80 p 3)

Hu Chuankui [5170 0278 2247]

Was elected chairman of the board of directors of Beijing Municipal Biomedical Engineering Society at its first meeting on 13 Mar 80. (Beijing GUANGMING RIBAO 24 Mar 80 p 2)

Huang Bingwei [7806 4426 4850]

Director, Institute of Geography, Chinese Academy of Sciences; was elected chairman of the board of directors of China Geography Society at its 4th congress held recently in Guangzhou. (Hong Kong ZHONGGUO XINWEN 7 Feb 80 p 2)

Jiang Houyuan [3068 0624 3220]

Director, Institute of Internal Combustion Engine; was recently admitted to the CCP. (Shanghai WEN HUI BAO 25 Mar 80 p 1)

Jiang Shengjie [1203 5110 7132]

Vice Chairman of the Board of Directors, China Nuclear Society. (Beijing GUANGMING RIBAO 20 Mar 80 p 1)

Li Guohao [2621 0948 6275]

Vice President, Shanghai Branch, China Scientific and Technological Association. (Beijing GUANGMING RIBAO 20 Mar 80 p 1)

Li Shounan [2621 1108 2809]

Deputy Director, Institute of Atomic Energy, Chinese Academy of Sciences. (Hong Kong ZHONGGUO XINWEN 26 Feb 80 p 4)

Li Zhengyi [2621 2973 3015]

Deputy Director, Institute of Fertilizers, Shanghai Municipal Academy of Agricultural Sciences. (Shanghai JIEFANG RIBAO 23 Mar 80 p 1)

Lin Bingnan [2651 4426 0589], Prof.

Director of Institute of Water Conservancy and Hydraulics [Shuigong Shuili xue Yanjiusuo 3056 1562 3055 9500 1331 4282 4486 2076], Academy of Water Conservancy and Hydroelectric Power; returned to China in 1955 after studies abroad. (Beijing GUANGMING RIBAO 9 Mar 80 p 2)

Mu Xiuhua [2476 4423 5478]

Deputy Director, Shanghai Institute of Light Industry. (Shanghai JIEFANG RIBAO 23 Mar 80 p 1)

Peng Shaoyi [1756 1421 6654]

Director, Shanxi Institute of Coal Chemistry, Chinese Academy of Sciences. (Beijing GUANGMING RIBAO 6 Mar 80 p 2)

Qian Xuesen [6929 1331 2773]

Chairman of the Board of Directors, China Mechanics Society. (Beijing GUANGMING RIBAO 20 Mar 80 p 1)

Rao Qinzhi [7437 2953 2972]

Deputy Director, Institute of Hydrobiology, Chinese Academy of Sciences. (Beijing GUANGMING RIBAO 3 Mar 80 p 2)

Tao Hengxian [7118 0077 0752]

Secretary General, China Mechanical Engineering Society. (Beijing GUANGMING RIBAO 20 Mar 80 p 1)

Wang Shizhen [3769 0013 4176], Prof.

Deputy Director, Institute of Medical Radiology, Chinese Academy of Medical Sciences. (Hong Kong ZHONGGUO XINWEN 26 Feb 80 p 3)

Xiao Yihan [5135 2496 1383]

Deputy Director, Second Institute of Oceanography, State Oceanography Bureau. (Hong Kong ZHONGGUO XINWEN 20 Feb 80 p 6)

Xu Guanren [1776 0385 0088], Prof.

Director, Institute of Atomic Energy Utilization in Agriculture, Chinese Academy of Agricultural Sciences. (Hong Kong ZHONGGUO XINWEN 26 Feb 80 p 6)

Yang Wenqi [2797 2429 0967]

Director, Shanghai Institute of Computer Technology and concurrently secretary of the CCP Committee at this institute. (Shanghai JIEFANG RIBAO 23 Mar 80 p 1)

Tao Shuceng [7118 6615 2582]

President, Hubei branch, China Scientific and Technological Association; attended the 2nd National Science Congress held in Beijing starting 15 Mar 80. (Beijing GUANGMING RIBAO 18 Mar 80 p 2)

Wu Fuzhen [0702 4395 2823]

An 83-year-old noted entomologist; Vice President, Ningxia Academy of Agricultural Sciences; member of the Academic Committee, Chinese Academy of Agricultural Sciences; currently participating in the compilation of ZHONGGUO JINJI KUNCHONGZHI [China's Economic Insects]. (Beijing GUANGMING RIBAO 21 Mar 80 p 2)

Zhang Lida [1728 4539 6671]

President, Liaoning Provincial Branch, China Scientific and Technological Association. (Beijing GUANGMING RIBAO 20 Mar 80 p 1)

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# ELASTIC STRESS AND STRAIN ANALYSIS FOR COLD ROLL FORMING PROCESS OF THE PLATE

Chongqing CHONGQING DAXUE XUEBAO [JOURNAL OF CHONGQING UNIVERSITY]  
in Chinese No 1, Mar 80 p 19

Chen Ruxin [7109 1172 2946], Xu Jianou [6079 0494 2962], and Deng Lixin  
[6772 4539 0207]

[Abstract] According to three-dimensional flowing theory, the numerical calculation was done by using matrix analysis method for the wrap which occurs on the transverse direction of the plate in the helical welding pipes during elastic-plastic forming processes of the plate.

In the mathematics pattern nonlinearity of material and geometry is considered. The stress-strain relationship derived from Yamada is adopted for plastic deformation. Every varied increment satisfies condition both of equilibrium and of compatibility.

The example shows that the calculated wrapping curve agrees with the practice and stress-strain corresponds with natural law.

CSO: 4020

## TORSION OF CLOSED THICK TOROIDAL SHELL

Chongqing CHONGQING DAXUE XUEBAO [JOURNAL OF CHONGQING UNIVERSITY]  
in Chinese No 1, Mar 80 p 40

Jiang Bingchen [3068 4426 3819]

[Abstract] On the basis of fundamental equations of three-dimensional problem of elasticity, series of asymptotic equations of torsion problem of closed thick toroidal shell has been established by expanding a power series with a small parameter. And by the thick toroidal shell with meridional sections of cocentre circle and eccentric circles, as examples, the solving process of the series of asymptotic equations and asymptotic characteristics of its solution are illustrated.

The stresses and deformations of mentioned above cases are discussed in detail. The numerical results of strength and stiffness of a wave-shaped junction box are given.

CSO: 4020



## THE E-TRANSFORM AND ITS APPLICATIONS

Chongqing CHONGQING DAXUE XUEBAO [JOURNAL OF CHONGQING UNIVERSITY]  
in Chinese No 1, Mar 80 p 62

Xie Shuyi [6200 2885 5669]

[Abstract] The E transform is a transform formed by means of series. It is used principally to solve the difference equations which describe the discrete systems. This paper treats the fundamental concepts and properties of the E-transform, and gives tables of rules and formulae of the E-transform. Finally we illustrate the applications of the E-transform. This includes solving the difference equation, their systems, the difference equations with variable coefficients or with two independent variables and the state vector equations. Besides, the paper also deals with the method of finding the sum of a series.

CSO: 4020

## THE RESONANCE METHOD TO TAKE MEASURE OF DAMPING OF VISCOUS-SHEAR DAMPER

Chongqing CHONGQING DAXUE XUEBAO [JOURNAL OF CHONGQING UNIVERSITY]  
in Chinese No 1, Mar 80 p 78

He Yusheng [0149 3254 3932] and Shen Heqian [3476 7729 0578]

[Abstract] This paper proves one to one correspondence single value function relationship between critical frequency of a torsional system of three disks and its damping by mathematical means. On the basis of this relationship we propose the resonance method to take measure of the damping of viscous-shear damper. The method has been proved right many times by experiments in the practical system which the paper introduces.

Damping is the most important factor that has an influence on the character of viscous-shear damper. It is very difficult to measure the damping in an ordinary way. However, the resonance method can take measure of it without breaking the damper, and the method is more economical, more convenient and faster than the usual ones. Therefore, we think the resonance method may have important meaning in production.

CSO: 4020

NUMERICAL STUDIES OF TRANSIENT PROCESS OF THE HIGH-SPEED IMPACT BETWEEN  
A WATER SLUG WITH CURVED HEAD AND A RIGID SURFACE

Chongqing CHONGQING DAXUE XUEBAO [JOURNAL OF CHONGQING UNIVERSITY]  
in Chinese No 1, Mar 80 p 87

Zhang Miaokang [1728 1680 1660]

[Abstract] The hydrodynamic problem of the high-speed impact between a water slug with curved head and a rigid surface assumes time-dependent inviscous compressible flow of fluid. It is governed by the equation of continuity and momentum for the liquid in cylindrical coordinates with axial symmetry, the isentropic equation of state for water. They are solved numerically by combined Eulerian and Lagrangian approaches, for a nonslip wall condition. The results of numerical calculation are indicated as follows: When the peak pressures are reached, the peak lateral velocities that are more than the impact velocity are reached instantly; the act time is independent of the impact Mach number approximately in lower impact Mach number; the peak pressures and the peak velocities increase along the radial direction outwards, and some experimental evidence supports this result.

CSO: 4020

EXPERIMENT AND RESEARCH ON THE DYNAMICAL PROPERTIES OF THE CRANKSHAFT  
GRINDING MACHINE

Chongqing CHONGQING DAXUE XUEBAO [JOURNAL OF CHONGQING UNIVERSITY]  
in Chinese No 1, Mar 80 p 98

Lei Jiyao [7191 4949 1031], Zhang Jisheng [1728 3444 3932], Wang Xiyu [3076 6932 5038], and Xu Chengji [1776 2052 1015]

[Abstract] The crankshaft grinding machine has its own properties. So far there were few literatures to discuss them. Through the experiments of the dynamical excitation and idle-running vibration of the crankshaft and cylindrical grinding machine Model MY8240, this paper gives the initial conclusions about the research of the dynamical properties of this kind of grinding machine.

CSO: 4020

A STUDY OF THE YTTRIUM DUCTILE IRON WELDING ELECTRODE AND THE PROCESS OF COLD REPAIR WELDING

Chongqing CHONGQING DAXUE XUEBAO [JOURNAL OF CHONGQING UNIVERSITY]  
in Chinese No 1, Mar 80 p 112

Niu Yinyi [2873 0936 0310], Ma Shouxi [7456 1108 0823], and Xie Zhengrong [6200 2973 2837]

[Abstract] This article presents the results obtained in the investigations on welding electrode with Yttrium ductile iron cast core and process of cold repair welding. Emphasis is laid on the discussion about the chemical components of electrode cast core and its processing as well as the composition of coating for it. The results show the fine weldability and low cost of this kind of welding electrode which can be coated with extruding machine. The effect of cold welding on microstructure of weld seam has been dealt with too. It will be seen from the results that under the conditions of adopting the method of continuous cold welding with this electrode and that of slow cooling after welding weld seam with a stable spheroidization and with a few cementites in its matrix can be obtained. So it will be of better rupture resistance and machinability. This new type of electrode has been tested in production, and the result is quite satisfactory.

CSO: 4020

Paleontology

AUTHORS: QIAN Yi [6929 6654]  
CHEN Menge [7115 1322 5458]  
CHEN Yiyuan [7115 2011 0337]

ORG: Yi of Nanjing Institute of Geology and Paleontology, Chinese Academy of Sciences, CHEN Menge of Institute of Geology, Chinese Academy of Sciences, CHEN Yiyuan of Wuhan Geological College

TITLE: "Hyolithids and Other Small Shelly Fossils From the Lower Cambrian Huangshandong Formation in the Eastern Part of the Yangtze Gorge"

SOURCE: Beijing GUSHENGWU XUEBAO [ACTA PALAEONTOLOGICA SINICA] in Chinese Vol 18 No 3, May 79 pp 207-228

EXCERPTS FROM ENGLISH ABSTRACT: This paper deals chiefly with Hyolithids and other small shelly fossils (including Rostrochonchia, Hyolithelmites, Porifera Cambroscleritida, etc.) from the Lower Cambrian Huangshandong formation in the Yichang county, Hubei province. In the type locality, the Huangshandong formation is overlain disconformably by the Shuijingtuo formation and underlain conformably by the Tongyin formation. From the lithological characters and the faunal contents, the Huangshandong formation may be divided into two parts.

(Continuation of GUSHENGWU XUEBAO, Vol 18 No 3, May 79 pp 207-228)

As a result from the present study, two assemblages may be recognized in the Huangshandong formation: Paleosulcachites-Lenatheca-Zhijinities-Heraultipegma-Sachites-Zeugites in its upper part and Anabarites-Circotheca-Protohertzina-Shipaitubulus in its lower part, both of which may be correlated respectively with the upper and lower assemblages of the meishucun formation or the Maidiping formation. Furthermore, taking into account the presence of the large amount of small shelly fossils which bear the faunal aspects similar to those of the Cambrian, the present authors tend to believe that the Huangshandong formation may be referable to the Cambrian age and that the boundary between the Cambrian and the Precambrian may be, therefore, drawn at the base of the Huangshandong formation, approximately corresponding to the Nemakit-Daldyn bed of U.S.S.R.

Received 15 November 1978

AUTHORS: YU Wen [0151 3080]

ORG: Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences

TITLE: "Earliest Cambrian Monoplacophorans and Gastropods from Western Hubei With Their Biostratigraphical Significance"

SOURCE: Beijing GUSHENGWU XUEBAO [ACTA PALAEONTOLOGICA SINICA] in Chinese Vol 18 No 3, May 79 pp 233-270

EXCERPTS FROM ENGLISH ABSTRACT: In the Yangtze Gorge, the earliest Cambrian deposits are well-developed and contain a great variety of skeletal faunas, such as monoplacophorans, gastropods, rostroconchis, hyolithids, hyolithelmites, brachiopods etc. These skeletal faunas may serve as the best substantial evidence for drawing the Precambrian Cambrian-boundary and for studying the early evolutionary history of phylum Mollusca.

The monoplacophorans and gastropods described and illustrated in the present paper were collected from the Huangshandong formation of Yichang district, Western Hubei. They contain 6 orders, 7 superfamilies, 14 families, 31 genera and 42 species, of which 2 orders, 3 superfamilies, 7 families, 25 genera, and 39 species are recognized as new.

(Continuation of GUSHENGWU XUEBAO, Vol 18 No 3, May 79 pp 233-270)

Received 29 December 1978.



AUTHOR: RUI Lin [5360 3829]

ORG: Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences

TITLE: "Upper Permian Fusulinids from Western Guizhou"

SOURCE: Beijing GUSHENGWU XUEBAO [ACTA PALAEONTOLOGICA SINICA] in Chinese Vol 18 No 3, May 79 pp 271-300

EXCERPTS FROM ENGLISH ABSTRACT: The fusulinids described and illustrated in this paper comprise 52 species or subspecies, of which 24 species are new. They were all collected from the Upper Permian in 9 localities of western Guizhou. Stratigraphically, the Upper Permian fusulinid-bearing formations in this region may be divided into two zones and two subzones.

AUTHOR: HONG Youchong [3163 0645 1504]

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TITLE: "Oxycephala Gen. Nov. A Miocene Homoptera (Insecta) From Linqi of Shandong"

SOURCE: Beijing GUSHENGWU XUEBAO [ACTA PALAEONTOLOGICA SINICA] in Chinese Vol 18 No 3, May 79 pp 301-307

TEXT OF ENGLISH ABSTRACT: Oxycephala, a new genus of Homoptera, from the Miocene Shanwang formation in Linqi of Shandong is here described and illustrated. Its diagnosis is briefly given below. Based on a comparatively complete specimen with the ventral part of body and the wings, this new genus is erected.

Type species: O. shanwangensis gen. et sp. nov.

Measurements: Body 24 mm in length; fore-wing 18 mm long, 8 mm wide; hindwing 16 mm long, 5 mm wide.

In the general morphological features, this new genus resembles somewhat the existing form of Fulgoridium (Fulgoridiidae), but differs in the venation, the corniform vertex (Vt), the very long rostrum (Lb), and the second joint which is two times longer than the third one.

Received 17 November 1978.

AUTHOR: DENG Bao [6772 1405]

ORG: Geological Department, Xi'an Mining College

TITLE: "On the Occurrence of Cyrtograptus (Graptolite) from Ziyang, Shaanxi"

SOURCE: Beijing GUSHENGWU XUEBAO [ACTA PALAEONTOLOGICA SINICA] in Chinese  
Vol 18 No 3, May 79 pp 308-311

TEXT OF ENGLISH ABSTRACT: This paper is to report the occurrence of the Middle Silurian Cyrtograptus from Ziyang of Shaanxi. The Middle Silurian deposits exposed in this area may be divided into two units: The Moba formation with C. ramosus above and the Shimen formation with C. munchisoni below. Of the Middle Silurian graptolites, C. munchisoni, a common form of the Lower Wenlock in Europe, has been recorded from the Wentoushan formation of Guangdong, and C. rigidus, the zonal fossil of the Middle Wenlock of Europe, has been found in the Upper Jenhochiao formation of Yunnan. But little has been known of those of the late Middle Silurian through lack of reliable evidences.

Since C. ramosus generally regarded as the characteristic form of the Upper Wenlock of Europe, was found in the Moba formation, it is here suggested that there exist in this area the early Middle Silurian and the late Middle Silurian as well.

Received 8 May 1978.

AUTHOR: SUN Ge [1327 7245]

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TITLE: "On the Discovery of Cycadocarpidium from the Upper Triassic of Eastern Jilin"

SOURCE: Beijing GUSHENGWU XUEBAO [ACTA PALAEONTOLOGICA SINICA] in Chinese  
Vol 18 No 3, May 79 pp 312-326

TEXT OF ENGLISH ABSTRACT: Recently, a large collection of fossil plants were made at Tianqiaolin in Wangqing of eastern Jilin. They, totalling about 20 in species, contain Articulatae, Dipteridae, Pteridospermae, Cycadales, Ginkgoales, Coniferae, in particular, Cycadocarpidium which is characteristic of late Triassic plants. On the whole, the flora is composed mainly of the elements of the "Dictyophyllum-Clathropteris Series" mixed with a few of the older forms as described by Sze (1965) in "the Yenchang Flora of N. Shensi." It may, more or less, be correlated with those from the Rhaetic formations in Sweden, E. Greenland, Japan, the southern part of USSR, Vietnam and South China. The age of this flora is assigned to the middle-late Late Triassic (i.e. Noric-Rhaetic). The appearance of a number of Dipteridae, Cycadales and Articulatae with fairly large size shows that the flora in question was flourishing in a moist and warm condition. Judging from the lithological and

(Continuation of GUSHENGWU XUEBAO, Vol 18 No 3, May 79 pp 312-326)

palaeogeographical evidence, this region seems most probably to belong to the subtropic or the temperate littoral zone in the late Triassic.

Among the collections, 8 species of Cycadocarpidium may be recognized, of which 2 species are new.

Received 12 April 1978.

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TITLE: "Microfossil Algae From the Lower Tertiary Shahejia Formation of Bin Xian, Northern Shandong"

SOURCE: Beijing GUSHENGWU XUEBAO [ACTA PALAEONTOLOGICA SINICA] in Chinese Vol 18, No 4 Jul 79 pp 327-346

EXCERPTS FROM ENGLISH ABSTRACT: About 14 species of Microfossil algae were macerated from the Shahejia Formation (Lower Tertiary) of Bin Xian, Shandong. Their systematic descriptions are given. (All type specimens are kept in the Herbarium, Department of Biology, Nanjing University).

From the 14 new species of fossil algae in the Shahejia Formation (Lower Tertiary) of the Bin Xian area, the following facts may be recognizable remarkably:

1. By the comparative studies of morphology and ecological distribution of these fossil algae with the present-day closely-related ones, most of the fossil algae in the area are definitely marine forms.

(Continuation of GUSHENGWU XUEBAO, Vol 18, No 4 Jul 79 pp 327-346)

2. The discovery of marine invertebrate Polychaetacean Sernula with marine Siphonacean Cladosiphonia sinensis Chu reminds us that both of them are marine organisms.

3. By the presence of some marine fossil fish-skeleton and some fragments of fossil corals, it gives us the fact that the deposits of this area were formerly marine in origin.

4. By the alternation of appearance and disappearance of unicellular dino-flagellate Deflandra and the colonial Chlorococcalean Pediastrum in the Shahejia formation (Lower Tertiary) of Bin Xian and neighbouring areas. It proved that since the Shahejiaian period the marine water had more than once invaded into this area.

In conclusion, the writer would like to suggest that the algae-bearing deposits of Bin Xian area were of marine origin.

Thanks are due Geology Chemical Experiment Laboratory of Shengli Oil Field for photography, Zeng Zhaoqi [2582 2507 3825] of Nanjing University for Micro-photography, Liu Xuexian [0491 7185 1288] for specimen measurement, and Chen Shugu [7115 2885 6253] for copying the draft.

Received 13 December 1978.

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TITLE: "Araxopora (Bryozoa) from the Lower Permian of Southwest China"

SOURCE: Beijing GUSHENGWU XUEBAO [ACTA PALAEONTOLOGICA SINICA] in Chinese Vol 18 No 4, Jul 79 pp 347-361

TEXT OF ENGLISH ABSTRACT: The bryozoan fauna in Southwest China (western Yangtze region), different sharply from those of North and West China, shows a regional aspect. It is characterized not only by a great development of Hinganotrypa (Lu, 1978), but by the occurrence of quite a number of Araxopora, which is a comparatively advanced genus of the Order Trepostomata. Up until now, about twelve species of Araxopora have been recorded from the Lower Permian. Among them, ten species, namely, A. araxensis (Nikiforova), A. petaliformis sp. nov., A. hayasakai (Yabe et Sugiyama), A. variana (Yang), A. chinensis, (Girty), A. tabuliformis sp. nov., A. sichuanensis sp. nov., A. permiana sp. nov., A. sp. and A. problema (Yang), are described in the present paper. The other two species, A. spicata Morozova and A. bifoliata Morozova were found in southern Caucasus.



Most of Araxopora were obtained from the Maokou Formation of late Lower Permian, but only a few, such as A. varians, A. permiana and A. petaliformis from the Chihnia Formation of the early Lower Permian. As a result, the Araxopora assemblage is established within the Maokou Formation of Southwest China, comprising two subassemblages: A. petaliformis-Sienodiscus delinghensis subassemblage in the lower and A. araxensis-A. tabuliformis subassemblage in the upper.

Through the investigation of a large number of specimens and various external morphological characters of the genus Araxopora from calcareous rocks, we conclude that this genus inhabited in comparatively deeper water conditions. The internal structures of different species show lineal relationships to the strata in which they dwell.

Received 23 June 1977.

AUTHOR: XU Hankui [6079 1332 1145]

ORG: Nanjing Institute of Geology and Palaeontology, Chinese Academy of Sciences

TITLE: "Brachiopods from the Tangxiang Formation (Devonian) in Nandan of Guangxi"

SOURCE: Beijing GUSHENGWU XUEBAO [ACTA PALAEONTOLOGICA SINICA] in Chinese Vol 18 No 4, Jul 79 pp 362-382

EXCERPTS FROM ENGLISH ABSTRACT: In South China, the marine Devonian deposits are well developed and widely distributed. They may be divided into two types, namely, the Xiangzhou type and the Nandan type. The Xiangzhou type is mostly composed of organic limestone, argillaceous limestone and marls and the dominant groups are benthos. The Nandan type consists mainly of black-grey carbonaceous and siliceous mudstone and the principal faunas are plankton. The Tangxiang Formation belongs to the Nandan type and its type locality is in Luofu of Nandan, Guangxi province. The main fossils occurring there are brachiopods, tentaculites, cephalopods, trilobites, bivalves and ostracodes. The cephalopods and the trilobites were studied respectively by Shen Yaoting (1975) and Xiang Liwen et Yi Yongen (1975) and the Plicanoplid brachiopods were described by the writer (1977).

(Continuation of GUSHENGWU XUEBAO, Vol 18 No 4, Jul 79 pp 362-382)

Exclusive of the Plicanoplids, the brachiopods described in this paper contain 20 genera and 26 species, including 2 new genera, 9 new species and 13 indeterminate species.

Received 27 June 1977.

AUTHOR: ZHOU Zuren [0719 4371 0088]

ORG: Regional Geological Surveying Team of Hunan

TITLE: "Distribution of the Early Permian Pseudohalorites-Fauna (Cephalopoda) in Hunan With Notes on Some New Genera"

SOURCE: Beijing GUSHENGWU XUEBAO [ACTA PALAEONTOLOGICA SINICA] in Chinese Vol 18 No 4, Jul 79 pp 383-394

EXCERPTS FROM ENGLISH ABSTRACT: A large number of Pseudohalorites have been discovered at many localities in central Hunan. Geographically, they are generally distributed in a east-west direction along the Baimashan-Lungshan structural belt. The Pseudohalorites-fauna is regarded as belonging to early to middle Maokouian of early Permian in age. In this paper, Yino-ceratinae is translated into a family rank, 2 new genera (Linonautilus and Shanyangoceras) and 5 new species (L. communis, L. nanus, S. jiangjiachongense, Lanceoloboceras hunanense and Waagenina xiangtanensis) are also described.

Received 8 June 1977.

AUTHOR: WANG Chengyuan [3769 2052 3293]

ORG: Nanjing Institute of Geology and Paleontology, Chinese Academy of Sciences

TITLE: "Some Conodonts From the Sipai Formation in Xiangzhou of Guangxi"

SOURCE: Beijing GUSHENGWU XUEBAO [ACTA PALAEONTOLOGICA SINICA] in Chinese Vol 18 No 4, Jul 79 pp 395-408

EXCERPTS FROM ENGLISH ABSTRACT: A small conodont fauna was found from the lower and the middle parts of the Sipai Formation in two localities of Xiangzhou county, Guangxi province. Thirteen species belonging to eight genera are here described, including the new species Polygnathus declinatus. Through the study of this conodont fauna, the writer is inclined to assign the Sipai Formation to the Upper Emsian in age.

Received 25 August 1977.

AUTHOR: CHEN Jinhua [7115 6855 5478]

ORG: None

TITLE: "The 3rd National Congress and the 12th Convention of Palaeontological Society of China held in Suzhou (April 16-22, 1979)"

SOURCE: Beijing GUSHENGWU XUEBAO [ACTA PALAEONTOLOGICA SINICA] in Chinese Vol 18 No 4, Jul 79 pp 409-414

TEXT OF ENGLISH ABSTRACT: Fifty years have elapsed, since the founding in 1929 of the Paleontological Society of China. With the aim to celebrate the 50th anniversary of the Society, to review the **research** fruits of paleontology gained in the past fifty years, especially following the founding of new China, and to organize the nation-wide paleontologists for realizing the modernization of the country, the Paleontological Society of China held from 16th-24th April in Suzhou the 3rd national congress and the 12th convention simultaneously. About 287 voting representatives and 216 nonvoting representatives, coming from research institutes, universities, geological colleges and geological prospecting units, etc. took part in the historical and splendid palaeontological meeting. Among them are old, middle-aged and young scientists, who happily got together, showing a vigorous, promising and flourishing scene.

(Continuation of GUSHENGWU XUEBAO, Vol 18 No 4, Jul 79 pp 409-414)

The meeting lasted for a week, with 3 main tasks on the agenda.

1. Summing up thirty years' achievements in paleontology of China and carrying on academic exchange in four sessions.
2. Revising the constitution of the Society and electing a new council.
3. Drawing up the work plan and setting up organizations of PSC.

Mr. Wang Bing-shi, Vice-Chairman of Jiangsu Provincial Revolutionary Committee, Mr Zhao Bei-ke, Deputy Secretary-General of the Chinese Academy of Sciences, Mr. Deng Bo-mu, who is in charge of Society Administrative Division of the National Association of Science and Technology, participated the opening ceremony and delivered their congratulatory speeches to the meeting. Besides, Prof C. Teichert, the President of International Palaeontological Association, Prof. O. H. Walliser, the Secretary-General of IPA, Prof. F. Takai, the President of Asian Branch of IPA and British Vertebrate Palaeontologist Delegation headed by Prof. T. S. Westoll also attended the meeting and offered their warmly congratulation.

(Continuation of GUSHENGWU XUEBAO, Vol 18 No 4, Jul 79 pp 409-414)

In his visit to native-town, Ge Ding-hang (Koh Ting-pang), an overseas Chinese now in the United States, who was an old member of PSC, was invited to attend the meeting. He donated a fossil specimen of Santaisaurus to the Chinese Academy of Science, a curiosa which he has carefully kept for more than 40 years. His patriotic spirit has won the great admiration of the people present at the meeting.

In the convention, Profs. Lu Yan-hao, Zhou Ming-zhen, Li Xing-xue Hao Yi-chun made their reports on "Thirty Years' Study of Invertebrate Paleontology in China," "Thirty Years' Study of Vertebrate Palaeontology in China," "Thirty Years' Study of Palaeobotany in China" and "Thirty Years' Study of Micro-palaeontology in China" respectively. They counted lots of facts to demonstrate what gigantic achievements have been obtained in the realm of palaeontology since the founding of new China. Taken for example, before the liberation of this country, less than thirty persons were working on several kinds of fossils. But today the paleontologists have greatly increased to about 2000 in number. Noticeably, talented persons have emerged in large number and research fruits have brought forth in great quantity. And what is more, the Chinese palaeontologists have caught up with the international advanced level in studying some kinds of fossils, and thus won many colleagues' admiration from abroad.

(Continuation of GUSHENGWU XUEBAO, Vol 18 No 4, Jul 79 pp 409-414)

The convention has received 152 scientific papers and 200 abstracts (in addition, about 379 papers dealing with micropalaeontology and palynology have been read in the micropalaeontological meeting and palynological meeting held last March in Changsha and Tianjin respectively). Of these papers, some were written by the veteran palaeontologists, but most by the middle-aged and the young scientists. These papers, involving comprehensive contents and important materials, deal with 1) paleobotany, 2) invertebrate palaeontology and 3) vertebrate palaeontology and palaeoanthropology, including the following special topics: evolution and classification, provinciality, paleoecology, palaeogeography, biostratigraphy and palaeontological investigation in Tibet etc. In recent years, came the reports on the finding of a considerable number of fossils from various corners of the country, which greatly enrich the collections of the palaeontological store-house of China. Basing on their systematical study of certain kinds of fossils, many Chinese palaeontologists, one after another, have put forward new assemblage successions and detailed zonation for stratigraphical subdivision. They have also made faunal or floral comparisons in world-wide or regional scope, and promoted new recognition in the geological history of ontogeny, phylogeny, classification, origin, prosperity-decline-extinct, migration, ecological environment and palaeogeography. Besides, in using new technique and filling the blanks in palaeontology, good results have been accomplished. All what have been

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doing indicate that the palaeontological study in China have been raised to a much higher level than ever before. Furthermore, the palaeontological evidences, undoubtedly, provide scientific bases for geological prospecting, exploration of oil, coal and various metals, inquiry of underground resources and engineer construction. The papers received in the convention will be reviewed by the editorial committee of the Society and then handed over to the press for publication.

Of the seven-days meeting, five and half days were allocated to academic activities. The convention, full of free atmosphere, followed from beginning to end the policies that letting a hundred flowers blossom and a hundred schools of thought contend, and employed various effective measures to serve the purpose that every scientist, whether same or different views, could benefit from the convention.

During the meeting-time, an exhibition was held for the members of the Society to visit. On display are about 130 selected fossil specimens obtained from the Ordovician to the Miocene of the Tibetan plateau and many books, monographs and periodicals published since the founding of the Society. Apparently, these exhibits show substantial and significant achievements in the study of biostratigraphy and palaeontology of this country, and therefore greatly attract the visitors' interest both at home and abroad.



(Continuation of GUSHENGWU XUEBAO, Vol 18 No 4, Jul 79 pp 409-414)

In the convention, Prof. T. S. Westoll, a fellow of the British Royal Society, Prof. D. L. Dineley, Secretary-General of Devonian Subcommittee of International Stratigraphical Committee, Prof. O. H. Walliser, Secretary-General of IPA, delivered lectures on their recent research results. The foreign guests also attended various academic activities and exchanged their views with Chinese colleagues. In this regard, it may be said that the convention marks the fruitful international exchange of ideas in the history of the Society.

Through a cordial and friendly talk with the leadership of IPA, the leadership of PSC came to an agreement with them that the final affiliation of the Palaeontological Society of China with IPA will be confirmed by the consent of other members of the executive committee of IPA.

At the close of the meeting, a new council of PSC was elected, the organizations of PSC were set up simultaneously and a discussion of the future activities of the Society was also made.

AUTHOR: None

ORG: Secretariat of PSC

TITLE: "During the Time of the 3rd National Congress and the 12th Convention of the Palaeontological Society of China, a New Council of PSC Was Elected"

SOURCE: Beijing GUSHENGWU XUEBAO [ACTA PALAEONTOLOGICA SINICA] in Chinese Vol 18 No 4 Jul 79 pp 414

TEXT OF ENGLISH ABSTRACT: President: Yin Zan-xun  
Vice-Presidents: Lu Yan-hao  
Zhou Ming-zhen  
Yang Zun-yi  
Mu En-zhi

Secretary-General: Yu Chang-min

Chief editor of "Acta Palaeontologica Sinica": Wang Yu

Chief editor of "Palaeontological Translation": Yang Zun-yi

10424

CSO: 4009

Physiology

AUTHORS: ZHANG Guilin [17282710 2681]  
WEI Jinpo [7614 0513 3134]  
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TITLE: "Effect of Stimulation of Midbrain Raphe Nuclei on the Discharge of Pain Sensitive Cells in Nucleus Parafascicularis of Thalamus and its Significance in Acupuncture Analgesia"

SOURCE: Beijing SHENGLI XUEBAO [ACTA PHYSIOLOGICA SINICA] in Chinese  
Vol 31 No 3, Jul 79 pp 209-218

TEXT OF ENGLISH ABSTRACT: This study presents data showing that electrical stimulation of the midbrain raphe nuclei of rabbits had a marked inhibitory effect upon the discharges of the pain sensitive cells in the nucleus parafascicularis (PF) of thalamus. Similar results were obtained by stimulating the nucleus reticularis tegmenti of midbrain and by ventricular injection of 5-hydroxytryptamine. The inhibitory effect persisted after section of the

(Continuation of SHENGLI XUEBAO, Vol 31 No 3, Jul 79 pp 209-218)

dorsal half part of spinal cord. This strongly suggested that the inhibitory effect could be solely mediated by ascending projections from the midbrain raphe nuclei.

The pain discharges of PF neurons could also be inhibited by electric needling of the Hegu point. After the dorsal half of the spinal cord was cut, the inhibitory effect due to the needling was diminished and the inhibitory after-effect following the termination of the needling. These results indicated that the descending inhibitory influence via the dorsolateral funiculi played a role in the inhibitory effect of acupuncture on the discharges of the pain sensitive cells in thalamus.

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ORG: Institute of Radiation Medicine, Academy of Military Medical Sciences,  
Beijing

TITLE: "Studies on the Enrichment and Function of Hemopoietic Stem Cells"

SOURCE: Beijing SHENGLI XUEBAO [ACTA PHYSIOLOGICAL SINICA] in Chinese  
Vol 31 No 3, Jul 79 pp 219-226

TEXT OF ENGLISH ABSTRACT: Cytotoxic agents and discontinuous density gradient centrifugation are widely used for the enrichment of hemopoietic stem cells from blood-forming tissues. On the fifth day of injection of vincristine and nitrogen mustard as scheduled in the experiment, the pluripotent stem cells (CFU-S) in murine bone marrow were concentrated by a factor of 3-4 as compared with the normal, further enrichment could be obtained following discontinuous density gradient centrifugation.

The percentage of reticulocytes in the peripheral blood, the cellularity in the femur bone marrow and spleen weight were measured at various intervals after 750 rad irradiation and injection of normal or CFU-S enriched bone marrow

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cells. Results showed that with increasing concentration of CFU-S in bone marrow cells the regeneration of haemopoiesis was observed earlier and proceeded at a faster rate.

The physiological activity of pluripotent stem cells in the bone marrow was influenced by the injection of vincristine and nitrogen mustard, i.e., more cells in resting state ( $G_0$ ) were triggered into cycling which was confirmed by the increase in number of cells killed by cytosine arabinoside.

The enhancement of hemopoietic recovery in those mice which were injected with the same number of CFU-S as normal control from donors pre-treated with cytotoxic agents and concentrated by discontinuous density centrifugation is likely due to the differences in number of cycling CFU-S and their high potential of proliferation.

Received 26 September 1978.

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TITLE: "Concerening the Binding Sites of Myofibril With Congo Red and the Dichroism Change With Myofibril Length of Congo Red Stained Glycerinated Sartorius Muscle Fibers"

SOURCE: Beijing SHENGLI XUEBAO [ACTA PHYSIOLOGICAL SINICA] in Chinese  
Vol 31 No 3, Jul 79 pp 227-238

TEXT OF ENGLISH ABSTRACT: After staining with Congo Red, the glycerinated toad or frog sartorius muscle shows clear dichroism. After incubating the stained muscle fibers at around 43 C for 10 minutes the dichroism practically vanished. If the glycerinated muscle fiber had been pretreated with ATP, they no longer showed dichroism after further staining with Congo Red. On the basis of these results and those reported previously, it was argued that those Congo Red molecules, which contributed to the dichroism of the stained muscle fibers, were mainly bound by myosin molecules, especially the S-1 subunits of them. Thus it seems that Congo Red might be a rather useful probe for studying the dynamic aspects of the S-1 subunits.

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In unstretched preparations, the sign of the dichroism is positive, showing that most of the Congo Red molecules bound by the myofibrillar proteins are oriented in the direction of the fiber axis. The absolute value of the dichroism decreases as the muscle is stretched and becomes zero as the sarcomere length reaches about  $3.3\mu$ , which, according to the interdigitating filament model of the myofibril, is approximately equal to the sum of the lengths of the myosin and actin filaments. With further stretching, the dichroism reappears, but its sign changes to negative showing that a large part of the bound Congo Red molecules are now oriented in a direction perpendicular to the fiber axis. No matter whether the muscle is stretched after or before staining, the results obtained are the same. The dichroism change is completed within the order of 10 milliseconds after each change of length. With the sarcomere length increasing from 1.7 to  $4.4\mu$ , the ratio of dichroism and optical density of the muscle fiber varies linearly. Stretching of the stained muscle increases the washing-out rate of Congo Red from the muscle fibers. An increase in pH value decreases the positive dichroism of the unstretched or slightly stretched muscle fibers, increases the negative dichroism of the stretched fibers, but has no effect on the dichroic properties of the fibers with sarcomere length around  $3.3\mu$ .

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Urea and alcohol can abolish the dichroism of both stretched and unstretched muscle fibers. The possible explanations concerning the dichroism change are discussed and it is argued that the possible change of crystallization of the contractile proteins with stretch may play a role.

Wu Linsen [0702 2651 2773] took part in the work.

Received 25 October 1978.

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TITLE: "Some Observations on Single Unit Response in the Auditory Area of Medulla of Toad"

SOURCE: Beijing SHENGLI XUEBAO [ACTA PHYSIOLOGICAL SINICA] in Chinese  
Vol 31 No 3, Jul 79 pp 239-248

TEXT OF ENGLISH ABSTRACT: The medullary area of the toad responding to auditory stimuli was delineated and the characteristics of the responses of its neurons to clicks and tone pips were studied. Most units were driven by input from ipsilateral stimulation. Spectral response analysis shows that neurons with maximum sensitivity at either 500-600 Hz or 1000-1200 Hz occurred most frequently. 4000 Hz was found to be the high frequency limit above which usually no response could be elicited at all. The threshold of different neurons fell in the range of 5-55 db above the human psychophysical threshold, with the majority of neurons at 25-30 db above. According to the latent period of the response to stimulation at the characteristic frequency, the neurons



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could be divided into long-latency (12 ms) and short-latency (about 3 ms) units. Neurons responding only to the onset, withdrawal or the whole period of tonal pip stimulation were all observed.

Received 6 November 1978.

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ORG: Research Laboratory on Physiology of Digestion and Reproduction,  
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TITLE: "Effect of Cyclic Nucleotides on DNA Synthesis in Rat Uterus"

SOURCE: Beijing SHENGLI XUEBAO [ACTA PHYSIOLOGICAL SINICA] in Chinese  
Vol 31 No 3, Jul 79 pp 249-254

TEXT OF ENGLISH ABSTRACT: Experiments were designed to observe the effect of four kinds of cyclic nucleotides on DNA synthesis in ovariectomized rat uterus and to compare with the effect of estradiol, by using the incorporation of  $^3\text{H}$ -thymidine into DNA in uterine tissue as criterion.

When  $1\mu\text{g}$  of estradiol was injected subcutaneously, a significant increase in the incorporation of  $^3\text{H}$ -thymidine into DNA in uterine tissue was observed. A similar effect was observed after intrauterine injection of  $16\text{ mM}$  cyclic AMP or cyclic UMP, but there was no effect with the same concentration of cyclic CMP and cyclic GMP.

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It was proposed that the stimulating effect of cyclic AMP and cyclic UMP on DNA synthesis is probably one of the mechanisms inducing the implantation of blastocysts in rats.

FAN Qinghua [2868 1987 5478] and HUANG Shiquan [7806 4258 0356] of Beijing Municipal Laboratory of Planned Parenthood took part in the work.

Received 11 December 1978.

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TITLE: "Effects of Cyclic Nucleotides on Blastocysts Implantation in Rats and Mice"

SOURCE: Beijing SHENGLI XUEBAO [ACTA PHYSIOLOGICAL SINICA] in Chinese  
Vol 31 No 3, Jul 79 pp 255-262

TEXT OF ENGLISH ABSTRACT: It was observed in this work that in delayed implantation in rats and mice, cyclic AMP may replace estrogen to cause implantation of blastocysts. We first observed that another cyclic nucleotide-cyclic UMP (cyclic uridine 3'5'-monophosphate) had similar effects. Two other cyclic nucleotides-cyclic GMP and cyclic CMP had rather weak effects on blastocyst implantation. Eighteen hours after intrauterine injection of cyclic AMP, the pontamine blue reaction was shown only in some of the experimental animals. However, the reaction was shown in most of the animals after 24 hours

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of injection. This indicates that the time needed for cyclic nucleotides to induce implantation was close to that of estrogen.

Thanks are due Professor WANG Xu (3769 1645) and ZHANG Lihe [1728 4409 0735] of Organic Chemistry Laboratory, Department of Materia Medica for providing supports. Received 11 December 1978.

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TITLE: "The Characteristics of Haemopoietic Stem Cells and Immunocompetent Cells Separated from Spleen and Blood by Velocity Sedimentation"

SOURCE: Beijing SHENGLI XUEBAO [ACTA PHYSIOLOGICAL SINICA] in Chinese  
Vol 31 No 3, Jul 79 pp 263-272

TEXT OF ENGLISH ABSTRACT: By using Simonsen's assay method and the techniques for the determination of CFU-S with irradiated recipient mice and of CFU-C with in vitro culture method, the characteristics of immunocompetent cells and of haemopoietic stem cells separated by velocity sedimentation from murine spleen

(Continuation of SHENGLI XUEBAO Vol 31 No 3, Jul 79 pp 263-272)

cells and peripheral leucocytes were investigated. In the experiment of spleen sedimentation velocities of total nucleated cells, CFU-S, CFU-C, and the responsive cells to Simonsen's assay method were 3.57, 4.50, 6.69 and 3.57 mm/hr respectively. In the case of peripheral leucocyte the sedimentation velocities of total nucleated cells, CFU-S and the responsive cells to Simonsen's assay method were 4.49, 4.96 and 3.12 mm/hr respectively. The results showed that haemopoietic stem cells and immunocompetent cells in the spleen are different in sedimentation velocities and profiles, but such differences found in the peripheral leucocytes are less prominent. Among the haemopoietic stem cells the CFU-C cell volume is larger than that of CFU-S, so that the separation of immunocompetent cells from CFU-C is much easier than from CFU-S. At present the separation of haemopoietic stem cells from immunocompetent cells is a critical problem in the bone marrow transplantation. The prospect of using the principle of cell sedimentation for separating immunocompetent cells from haemopoietic stem cells, thereby reducing the severity of GVHR in haemopoietic stem cell transplantation is discussed.

Received 14 December 1978.

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JIANG Zhihua [5592 5347 5478]  
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ORG: Shanghai Institute of Physiology, Chinese Academy of Sciences

TITLE: "Influences of Intracerebral Injection of 6-OH-DA on Acupuncture Analgesia and Monoaminergic Neurons' Histofluorescence of Dorsal Raphe Nucleus"

SOURCE: Beijing SHENGLI XUEBAO [ACTA PHYSIOLOGICAL SINICA] in Chinese  
Vol 31 No 3, Jul 79 pp 273-282

TEXT OF ENGLISH ABSTRACT: The effects of the dorsal raphe injection of 6-OH-DA were studied on albino rats with both behavioral and fluorescence histochemical method. The experimental animals were divided into two groups: one received the 6-OH-DA injection and the other received a vehicle injection.

It was found that the acupuncture analgesic effect was enhanced at 2 and 7 days after the administration of 6-OH-DA. At these times the NA terminals in the dorsal raphe nucleus nearly disappeared, while the 5-HT containing neurons in the same nucleus remained intact. Sometimes the latter even showed a slight increase in fluorescence intensity. The control group showed no change

(Continuation of SHENGLI XUEBAO Vol 31 No 3, Jul 79 pp 273-282)

in both the acupuncture analgesia and the fluorescence histochemistry. The result provides a direct experimental evidence for the close relationship between NA and 5-HT in the dorsal raphe nucleus to acupuncture analgesic effect.

Hu Xianzhen [5170 0341 3791] of Nanjing University took part in some work.

Received 22 December 1978.

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TITLE: "Prematurity of Human Endometrium After Oral Administration of Progestin No 1 Compound Tablet"

SOURCE: Beijing SHENGLI XUEBAO [ACTA PHYSIOLOGICAL SINICA] in Chinese  
Vol 31 No 3, Jul 79 pp 283-294

TEXT OF ENGLISH ABSTRACT: This paper presents the results of the investigation of the histological (Glycogen and Alkaline phosphatase) changes in the human endometrium after oral administration of the Progestin No 1 Compound Tablet. The Progestion No 1 Compound Tablet is a new type once-a-month tablet, administered on Day 10 of the menstrual cycle. The tablet is composed of a new synthetic progestin, the Progestin No 1 (3-cyclopentyl propionate of Megestrol acetate), and small amounts of Quinestrol. Fifty-one biopsy specimens of human endometria including the control group (thirty cases) and the treated group (twenty-one case) were analysed.

In general, the endometrium of the control group converted from the proliferative phase to the early secretory phase on Day 16 of the menstrual cycle; it then developed to the late secretory phase on Day 21 and to the premenstrual phase on Day 26. However, the endometrium of the treated group developed to the corresponding phases on Day 12, 17 and 20 of the cycle respectively. Therefore, the conversion of the endometrium of the treated group was several days earlier than that of the control group.

The contraceptive mechanism of the tablet was discussed. It has been suggested that the earlier conversion of the endometrium may interfere with the synchronization between the age of the egg and the development of the endometrium, and consequently prevent the ovum implantation.

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TITLE: "The Use of Anti-Dextran Sulfate-LRH Serum in Immunohistochemical Localization of LRH in Median Eminence of the Rat Hypothalamus"

SOURCE: Beijing SHENGLI XUEBAO [ACTA PHYSIOLOGICAL SINICA] in Chinese Vol 31 No 3, Jul 79 pp 295-302

TEXT OF ENGLISH ABSTRACT: Rabbit antiserum raised against dextran sulfate-LRH by immunoperoxidase technique, without pre-incubation with the carrier used. The distribution of LRH in the median eminence of female adult rat was studied at light microscopy level. Populations of beaded axons stained brown were revealed clearly. The total length of median eminence, beginning from the infundibular recess to the full separation of infundibular stalk from the base of brain was found to be 1500-1800  $\mu$ m according to the thickness of serial



sections. When this length was divided into four segments, the majority of the immunoreactive beads of LRH was found to be located in the terminals of neuronal processes concentrating in the palisade layer of the median eminence near the portal capillaries.

Received 6 January 1979.

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TITLE: "The Effect of Ionizing Radiation on Pure Tone Frequency Discrimination and Immediate Memory in Monkeys (Macaca Mulatta)"

SOURCE: Beijing SHENGLI XUEBAO [ACTA PHYSIOLOGICAL SINICA] in Chinese  
Vol 31 No 3, Jul 79 pp 303-308

TEXT OF ENGLISH ABSTRACT: By using the shuttle box defensive conditioning method, pure tone frequency discrimination and immediate memory were studied in 9 monkeys (Macaca mulatta); the effect of ionizing radiation on learning and memory was observed.

1. In monkeys which received a single dose of 200 rads  $\gamma$ -ray of whole body irradiation, the tone frequency discrimination (intensity, 70 db above the threshold of human hearing), was impaired severely. However, the easier discriminative task could be performed again two months after the irradiation, while the ability for the harder one (990 Hz v. 1,000 Hz) was not regained.

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2. In monkeys, whose heads were exposed to multiple X-irradiation with accumulated doses totalling 10,000 r (400 r a dose, delivered every other day) the tone frequency discrimination and immediate memory were impaired. But such effects were transitory.

Thanks are due XU Zuojie [1776-0146-2638] of Institute of Biochemistry, Chinese Academy of Sciences for assisting in X-irradiation, and Second University of Military Medical Science for providing 60 cobalt irradiation source. WEI Youmin [0604 0645 3046] and LU Jingeng [7120 6930 5087] took part in some work.

Received 8 July 1978.

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TITLE: "A Facilitatory Effect Produced by Electrical Stimulation of Cerebral Cortex in Young Rabbits"

SOURCE: Beijing SHENGLI XUEBAO [ACTA PHYSIOLOGICAL SINICA] in Chinese  
Vol 31 No 3, Jul 79 pp 309-313

TEXT OF ENGLISH ABSTRACT: The excitability of cerebral cortical neurons of young rabbits was studied by means of direct electrical stimulation. Following a single shock or a train (4-second intervals) of electric shocks, the cortical neurons underwent a relatively long period of facilitation as evidenced by the enhancement of threshold response. The facilitation could be produced in different areas of the cerebral cortex. The duration of facilitation lasted from 10 seconds to more than 20 minutes. The facilitation was more pronounced in younger animals after repetitive and stronger stimulations. The difference between this kind of facilitation and other known facilitations is briefly discussed.

Received 1 November 1978.

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TITLE: "A Needle-Form Micro-Oxygen Electrode and Its Application"

SOURCE: Beijing SHENGLI XUEBAO [ACTA PHYSIOLOGICAL SINICA] in Chinese  
Vol 31 No 3, Jul 79 pp 314-318

TEXT OF ENGLISH ABSTRACT: The construction of a needle-form micro-oxygen electrode was described in detail. All the materials and techniques employed were available in ordinary laboratory. The electrode was found to be very suitable for the measurement of oxygen tension in blood, muscle as well as cerebral tissues.

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